



valve jet; this indicates that you are close to the valve opening and will aid in crossing the valve.

The transverse computed tomography image of the AV with the schematic overlay (**Figure 2**, left) depicts the recommended course of the straight wire (along the dotted red line in the direction of the arrowhead) from the posteriorly seated noncoronary cusp toward the center of the stenotic valve.

An eccentric opening of the AV (**Figures 2B and 2C**) can be a hindrance to crossing the valve using our described technique. In these cases, using a right Judkins (JR-4) catheter or a pigtail catheter can be helpful in crossing the valve. If the eccentric opening is toward the left cusp (**Figure 2B**), then, in your implantation view, point the JR-4 or pigtail catheter toward the left cusp and begin with the straight wire in the left cusp and work slowly toward the eye of the pigtail. If the eccentric opening is toward the noncoronary cusp (**Figure 2C**), then point the JR-4 or pigtail catheter toward the noncoronary cusp and work your straight wire slowly from the noncoronary cusp toward the eye of the pigtail. Softer wires, such as a Glidewire, can sometime help with crossing the AV with an eccentric opening.

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## Calcified Nodule Mimicking Red Thrombus on Optical Coherence Tomography



The single case report by Hao et al. (1) describing the unique pathological microstructure of a calcified nodule (CN) in an 89-year-old woman dying of congestive heart failure provides unique clues to

advance our ability to interpret the images provided by intracoronary diagnostic techniques. The beauty of this report is that a detailed pathological analysis of the CN was combined with corresponding intravascular ultrasound (IVUS), optical coherence tomography (OCT), and coronary angiography findings. Of note, this CN was not complicated because it was completely covered by a continuous endothelial layer and had no trace of any residual superficial thrombus. Interestingly, however, the inner aspect of the CN had multiple patchy, irregular, calcified areas, some of which were associated with fibrin deposition and others showing neovascularization. As expected, IVUS depicted a bright protruding mass with marked posterior shadowing, the hallmark of a heavily calcified plaque with this technique. Surprisingly, however, on OCT, a bright protruding mass with an irregular surface causing major dorsal shadowing was detected. This, in turn, constitutes the hallmark of a large “red thrombus” by this technique, as emphasized in all the available consensus documents on OCT (2,3) and some dedicated original reports (4). An adjacent image of classic superficial calcification (a dark area with sharply delineated borders without attenuation) was also demonstrated by OCT, corresponding well with the adjacent calcified plaque (bright echoes with shadow) also disclosed by IVUS (1).

We previously suggested that some CNs may actually induce intense dorsal shadowing that makes the differential diagnosis difficult of this elusive clinical entity (5,6). However, this concept is still not widely accepted (2-4). Furthermore, we have also suggested that a complication on a superficial “nonprotruding” calcified plaque may cause an acute coronary syndrome (5). In this setting, superficial calcification with images suggestive of a protruding red thrombus versus protruding bony calcified spicules may be unraveled by OCT (5). The striking images provided by Hao et al. (1) showing a close correlation between pathological and OCT findings in a human coronary artery are instrumental in demonstrating that uncomplicated CNs may actually present as irregular protruding bright masses inducing major shadowing on OCT. Whether similar OCT findings may be induced by CNs without internal fibrin deposition warrants further investigation (1). Moreover, these pathological findings emphasize that OCT images highly suggestive of a red thrombus may actually emerge from uncomplicated nonculprit lesions. Oftentimes, a single image generates more convincing evidence than large studies or wordy speculative expert discussions. We need to keep learning from the never-ending

surprises that are continuously offered in the clinical setting.

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## REPLY: Calcified Nodule Mimicking Red Thrombus on Optical Coherence Tomography



We thank Dr. Alfonso and colleagues for their interest in our vignette. Our meticulous comparison of the intravascular imaging and histology of a calcified nodule (CN) indicates the discrepancy of these findings, particularly for the presence of a red thrombus (1). The clinical significance of a CN with complete endothelial coverage is strikingly different from a large red thrombus formation. Such a CN without severe stenosis in nonculprit lesions may have a benign prognosis. Coronary intervention for a fully endothelialized CN could produce an “iatrogenic” complicated lesion. Therefore, we should pay